Claims

1. A process for the separation and recovery of boron from aqueous solution containing the same, comprising
   - separating strongly dissociated anions in the form of electrical migration performed in one diluted compartment of an electrochemical cell, which is filled with cation-exchange materials;
   - separating dissociated cations such as $^7Li^+$ in the form of ion-exchange/electrical migration in the same compartment above;
   - separating boron in the form of electrochemical/chemical dissociation, ion-exchange/adsorption, and electrical migration performed in another diluted compartment filled by anion-exchange material only, or a mixture of anion- and cation-exchange materials, or layers separated between the anion- and cation-materials;
   - recovering the separated cations into the catholyte compartment of the electrochemical cell;
   - recovering the separated boron into the anolyte compartment of the electrochemical cell;
   - recirculating the anolyte in the anolyte compartment;
   - recirculating the catholyte in the catholyte compartment; and
   - recirculating the diluted solution in the diluted compartment if necessary.
2. The process according to claim 1, wherein a five-compartment electrochemical cell is used to carry out the process.
3. The process according to claim 2, wherein the five-compartment electrochemical cell consists of at least two diluted compartments, two anolyte compartments, one catholyte compartment, one anode and two cathodes.
4. The process according to any of the preceding claims, wherein the diluted compartments are separated from the anode by an anion-exchange membrane and separated from one of the cathodes by a cation-exchange membrane.
5. The process according to any of the preceding claims, wherein DC potential is applied between the anode and the cathode.

6. The process according to any of the preceding claims, wherein one anolyte compartment is used for collecting the separated strongly dissociated anions, such as chloride, nitrate and sulfate, and another anolyte compartment is used for recovering the separated boron.
7. The process according to any of the preceding claims, wherein the catholyte compartment is used for collecting the separated cationssuch as $^{7}Li^{+}$.
8. The process according to any of the preceding claims, wherein the initial anolyte is the pure solution of boric acid, and the initial catholyte is the pure solution of a given cation that may be recovered, and the initial concentrations of the anolyte and catholyte are appropriately adjusted for performing the separation and recovery of boron and a certain cation.
9. The process according to any of the preceding claims, wherein the ion-exchange materials filled in the diluted compartments are ion-exchange resins having uniform particle size and the same mean diameter of resin beads for both anion and cation resins.
10. The process according to any of the preceding claims, wherein the separation of boron from strongly dissociated anions is performed before the separation of boron in a following diluted compartment.
11. The process according to any of the preceding claims, wherein the separation of boron from strongly dissociated anions and the separation of cations are performed in the same diluted compartment.
12. The process according to any of the preceding claims, wherein the electrochemical dissociation of boric acid in the first diluted compartment is reduced by controlling the density of DC current during the separation of boron with strongly dissociated anions, the applied current density being controlled below 0.1 A/dm^2, and the electrochemical dissociation of boric acid is reduced below 15% as the initial concentration of boron is about 2000 ppm.
13. The process according to any of the preceding claims, wherein the DC current applied to the electrochemical cell is appropriately adjusted to keep a balance among the electrochemical dissociation of boric acid, the electrical migration of anions and water splitting for the regeneration of ion-exchange materials.
14. The process according to any of the preceding claims, wherein the separation and recovery of boron can be performed for an aqueous solution with a wide rang of initial concentration of boron from several thousands ppm to several tens ppm.

15. The process according to any of the preceding claims, wherein a high efficiency of boron separation is achieved, the separation percentage of boron being over 95%.
16. The process according to any of the preceding claims, wherein a high concentrating limit is achieved for boron recovery, the concentration of boron in the anolyte being up to 80% of the solubility of boric acid.
17. The process according to any of the preceding claims, wherein the separation and recovery of boron and a given cation like lithium such as $^7Li^+$ may be performed at the same time.
18. The process according to any of the preceding claims, wherein the treatment of the aqueous solution is performed in a recirculating model, a follow-through model or a partial-recirculating model.